

CLAIMS

- 1 1. An optical system comprising:
2 a substantially planar substrate; and
3 a waveguide channel at least a portion of which is at least partially buried in
4 said substrate, said waveguide channel having a portion exhibiting a taper in two
5 dimensions.
- 1 2. The optical system of claim 1, wherein said waveguide channel defines an
2 optical axis and lacks continuous rotational symmetry about said optical axis.
- 1 3. The optical system of claim 1, wherein said waveguide channel is elongate
2 along a light propagation path of said waveguide channel; and
3 said substrate is shaped to accommodate an optical component aligned with
4 said light propagation path.
- 1 4. The optical system of claim 1, wherein said substrate defines a locating
2 contour, said locating contour being adapted to engage an optical component such that
3 engagement of the optical component with said locating contour positions the optical
4 component for optically communicating with said waveguide channel.

1 5. The optical system of claim 1, wherein said waveguide channel is entirely
2 buried in said substrate.

1 6. The optical system of claim 1, further comprising:
2 an input transmission medium optically communicating with said waveguide
3 channel, said input transmission medium being configured to propagate light to said
4 waveguide channel; and
5 an output transmission medium optically communicating with said waveguide
6 channel, said output transmission medium being configured to propagate light from
7 said waveguide channel.

1 7. The optical system of claim 1, wherein said waveguide channel is a first
2 waveguide channel; and
3 said optical system further comprises:
4 a second waveguide channel at least a portion of which is at least partially
5 buried in said substrate, said second waveguide channel having a portion exhibiting a
6 taper in two dimensions.

1 8. The optical system of claim 7, further comprising:
2 means for propagating light between said first waveguide channel and said
3 second waveguide channel.

1 9. The optical system of claim 1, wherein said waveguide channel includes a first
2 waveguide channel portion, a second waveguide channel portion and a linking portion
3 located along a light propagation path between said first waveguide channel portion
4 and said second waveguide channel portion, said linking portion being at least
5 partially buried in said substrate, said linking portion being adapted to propagate light
6 between said first waveguide channel portion and said second waveguide channel
7 portion.

1 10. The optical system of claim 9, wherein a trench is formed through at least a
2 portion of said linking portion, said trench being adapted to receive an optical
3 component.

1 11. The optical system of claim 10, further comprising:
2 an optical component arranged at least partially within said trench, said optical
3 component being adapted to propagate light between said first waveguide channel
4 portion and said second waveguide channel portion.

1 12. A method for forming an optical system, said method comprising:
2 providing a substrate;
3 depositing on the substrate a first contoured channel preform of material
4 capable of ion exchange with the substrate; and
5 diffusing ions from the first channel preform into the substrate to form a first
6 waveguide channel at least a portion of which is at least partially buried in the
7 substrate.

1 13. The method of claim 12, wherein diffusing ions from the first channel preform
2 into the substrate comprises:
3 providing an ionic liquid;
4 immersing the substrate with the deposited first channel preform in the ionic
5 liquid such that a first portion of the ionic liquid engages the first channel preform and
6 a second portion of the ionic liquid engages the substrate; and
7 applying an electric potential across the first portion and the second portion of
8 the ionic liquid such that ions from the first channel preform diffuse into the substrate.

1 14. The method of claim 12, wherein in depositing the first channel preform, the
2 first channel preform is contoured with a varying width.

1 15. The method of claim 12, wherein in depositing the first channel preform, the
2 first channel preform is contoured with a varying height.

1 16. The method of claim 12, wherein in depositing the first channel preform, the
2 first channel preform is contoured with both a varying width and height; and
3 wherein in diffusing ions from the first channel preform into the substrate, the
4 first waveguide channel at least partially buried in the substrate is formed as an
5 elongate, two-dimensionally tapered waveguide channel.

1 17. The method of claim 12, wherein the step of providing a substrate comprises
2 providing a substrate comprising sodium cations; and
3 wherein the step of providing an ionic liquid comprises providing a melt
4 comprising sodium nitrate.

1 18. The method of claim 12, further comprising:
2 removing a portion of the first waveguide channel to form a trench, the trench
3 being configured to receive an optical element; and
4 arranging an optical element at least partially within the trench, the optical
5 element being configured to communicate optically with the first waveguide channel.

1 19. The method of claim 12, further comprising:
2 optically coupling an input transmission medium to the first waveguide
3 channel, the input transmission medium being configured to propagate light to the
4 first waveguide channel; and
5 optically coupling an output transmission medium to the first waveguide
6 channel, the output transmission medium being configured to propagate light from the
7 first waveguide channel.

1 20. A waveguide component formed by the process of claim 12.

1 21. The method of claim 12, further comprising:
2 depositing on the substrate a second contoured channel preform of material
3 capable of ion exchange with the substrate; and
4 diffusing ions from the second channel preform into the substrate to form a
5 second waveguide channel at least partially buried in the substrate.

1 22. The method of claim 21, further comprising:
2 forming a trench along a light propagation path between the first waveguide
3 channel and the second waveguide channel, the trench being configured to receive an
4 optical element; and
5 arranging an optical element at least partially within the trench, the optical
6 element being configured to communicate optically with the first waveguide channel
7 and the second waveguide channel.